I-82/South Union Gap Interchange - Construct Ramps

Project Design Parameters

For

X Line

Main Street EB On-Ramp to I-82 EB

Date: July 2019 Design Manual M 22-01.14 (July 2017)

Functional Classification	Ramp
Design Year	2035
Design Vehicle	WB-67 and 109D
Target Speed	35 to 60 MPH
Posted Speed	N/A
ADT:	7,000
Truck Percentage	10%
Right of Way Width:	Varies
Terrain	Rolling
Access Control	Limited/Full

Prepared By: NJB

Date Prepared: 8/19/2019

General Design Elements	Detailed Design Elements (Parameters)	Changed Elements See Note 1	Physical Feature/Location	Existing Dimension	Design Manual Dimension	Proposed Dimension	Reference/Notes
1. Lane	Design Element Not Applicable						
2. Median / Buffer	Design Element Not Applicable						
3. Shoulder	Design Element Not Applicable						
4. Streetside / Roadside Zone	Design Element Not Applicable						
5. Pedestrian Facility	Design Element Not Applicable						
6. Bicycle Facility	Design Element Not Applicable						
7. Bridges	Design Element Not Applicable						
8. Horizontal Alignment	Stopping Sight Distance	N/A					
	Passing Sight Distance	N/A					
	Decision Sight Distance	N/A					
	Curve Lengths	X	X Line (296+64 to 303+82)	793-ft	500-ft desirable	718-ft	DM 1210.02(3) Meet WB-67 and 109D Turning Movement Requirements
			X Line (309+59 to 312+40)			281-ft	
	Horizontal Curve Radii	X	X Line (296+64 to 303+82)	1,165-ft	145-ft min	1,100-ft	DM Exhibit 1250-4a 10% Max Superelevation Table Meet WB-67 and 109D Turning Movement Requirements
			X Line (309+59 to 312+40)			17,116-ft	
	Max. Defl. Angle w/o Curve	X	X Line (296+64)	0°	1°38'	0°	DM Exhibit 1210-1
	Lane Balance	N/A					
	Climbing Lanes	N/A					
	Spacing betw. Interchanges	N/A					
	Spacing betw. Ramp Noses	N/A					
	Lane Width Transition	N/A					
	Increase Number of Lanes	N/A					
	Channelization Taper - Left	N/A					
	Channelization Taper - Right	N/A					
	U-turn width (List any elements changed - See Chapter 1310)	N/A					
	Curbs on High Speed Road	N/A					
	OTHER						

General Design Elements	Detailed Design Elements (Parameters)	Changed Elements See Note 1	Physical Feature/Location	Existing Dimension	Design Manual Dimension	Proposed Dimension	Reference/Notes
9. Vertical Alignment	Stopping Sight Distance	X	X Line (X 299+38 to X 301+66)	349-ft	250-ft	251-ft	DM Exhibit 1260-1
			X Line (X 302+62 to X 305+47)	238-ft		252-ft	
	Decision Sight Distance	N/A					
	Passing Sight Distance	N/A					
	Minimum Grade	X	X Line (X 299+38 to X 301+66)	3.01%	Varies	2.27%	DM 1220.02(4) To meet draingae requirements. Ditch gradient independent of roadway grade if necessary.
			X Line (X 302+62 to X 305+47)	0.37%		0.15%	
	Length of Grade	X	X Line (X 300+52 to X 304+05)	454-ft	750-ft max	353-ft	DM Exhibit 1220-1
	Vertical Curve Length	X	X Line (X 299+38 to X 301+66)	400-ft	75-ft min	228-ft	DM Exhibit 1260-1
			X Line (X 302+62 to X 305+47)	200-ft		285-ft	
	Maximum Grade	X	X Line (X 299+38 to X 301+66)	5.29%	Varies	5.61%	DM 1220.02(3)
			X Line (X 302+62 to X 305+47)			5.61%	
	OTHER						
10. Cross Slope	Cross Slope Lane	X	X Line Throughout Project	Varies	2% min	2% min	DM 1250.02(1)
	Cross Slope Shoulder	X	X Line Throughout Project	Varies	2% min	2% min	DM 1250.02(2)
	Cross Slope Grade Differential	N/A					
	Superelevation	X	X Line Throughout Project	6%	6%	6%	DM Exhibit 1250-4a 10% Max Superelevation Table Meet WB-67 and 109D Turning Movement Requirements
	Super Transition / Runoff	X	X Line Throughout Project	100-ft	100-ft (35 mph, 6% Super)	100-ft	DM Exhibit 1250-7b
	OTHER						
11. Side Slope	Fill Slope	X	X Line Throughout Project	2:1 max	2:1 max	1:1 max with reinforced slope	DM 1600.03(1)(a)
	Ditch In-Slope	N/A					
	Ditch Back Slope	N/A					
	Cut Slope	X	X Line Throughout Project	2:1 max	2:1 max	2:1 max	DM 1600.03(1)(b)
	OTHER						
12. Clear Zone	Clear Zone	X	X Line Throughout Project	Varies	Varies 10-ft to 41-ft	Protected by Guardrail/Barrier	DM Exhibit 1600-2
	OTHER						
13. Barrier, Guardrail & Rumble Strips	Standard Run	X	X Line Throughout Project	Beam Guardrail Type 1	Beam Guardrail Type 31	Beam Guardrail Type 31	DM 1610.03(5)
	Height	X	X Line Throughout Project	Guardrail: 28-in	Guardrail: 31-in min	Guardrail: 31-in min	Guardrail: DM 1610.04(1)(a) Sight Distance, Route Continuity, Freight Traffic, & Bike/Ped Safety
	Lateral Clearance	X	X Line (304+86)	Non-flared terminal	Non-flared terminal, TL-2 or TL-3	Non-flared terminal	DM1610.04(5)(b)
	Transition Section	X	X Line Throughout Project	-	Type 21	Type 21	DM Exhibit 1610-13
	End Treatment	X	X Line Throughout Project	Non-flared terminal	Non-flared terminal, TL-2 or TL-3	Non-flared terminal	DM 1610.04(5)(b)
	Rumble Strips	N/A					
	OTHER						

General Design Elements	Detailed Design Elements (Parameters)	Changed Elements See Note 1	Physical Feature/Location	Existing Dimension	Design Manual Dimension	Proposed Dimension	Reference/Notes
14. Signals, Illumination, and ITS	Signals	N/A					
	Illumination	X	X Line Throughout Project	Varies	Varies	Varies	DM 1040.04(1)
	ITS	N/A					
	Vertical Clearance	N/A					
	OTHER						
15. Signing and Delineation	Signing	X	X Line Throughout Project	Varies	Varies	Varies	DM 1020
	Delineation	X	X Line Throughout Project	Varies	Varies	Varies	DM 1030
	Vertical Clearance	N/A					
	OTHER						
16. On/Off Connections	On/Off Connection Type	X	X Line On-ramp	Single-Lane,Tapered	Varies	Single-Lane,Tapered	DM 1360.04(5)
	Acceleration length	X	X Line (X 303+82 to L 448+67)	845-ft	800-ft min	910-ft	DM Exhibit 1360-9
	Deceleration Length	N/A					
	Ramp / Mainline Taper	N/A					
	Gap Acceptance	N/A					
	Transition curve	N/A					
	Enforcement Area	N/A					
	Ramp Meter Storage	N/A					
	Weave	N/A					
	Gore Area	X	X Line (305+56)	4-ft radius	4-ft min radius	4-ft radius	DM Exhibit 1360-16
	Reserve Area Length	N/A					
	Reserve Area Taper	N/A					
	OTHER						
17. Intersection / Ramp Terminal	**Design Element Not Applicable**						
18. Road Approaches	**Design Element Not Applicable**						
19. Roundabout	**Design Element Not Applicable**						
20. Access	**Design Element Not Applicable**						

I-82/South Union Gap Interchange - Construct Ramps

Project Design Parameters

For

N Line

SR-97 NB On-Ramp to I-82 WB

Date: May 2019 Design Manual M 22-01.14 (July 2017)

Functional Classification	Urban Principal Arterial
Design Year	2035
Design Vehicle	WB-67 and 109D
Target Speed	55 to 60 MPH
Posted Speed	N/A
ADT:	3,000-9,500
Truck Percentage	10% to 14%
Right of Way Width:	Varies
Terrain	Rolling
Access Control	Limited/Full

Prepared By: NJB

Date Prepared: 8/19/2019

General Design Elements	Detailed Design Elements (Parameters)	Changed Elements See Note 1	Physical Feature/Location	Existing Dimension	Design Manual Dimension	Proposed Dimension	Reference/Notes
1. Lane	Design Element Not Applicable						
2. Median / Buffer	Design Element Not Applicable						
3. Shoulder	Design Element Not Applicable						
4. Streetside / Roadside Zone	Design Element Not Applicable						
5. Pedestrian Facility	Design Element Not Applicable						
6. Bicycle Facility	Design Element Not Applicable						
7. Bridges	Lane Type	N/A					
	Width Tangent Roadway	N/A					
	Width Turning Roadway	N/A					
	Shoulder Width - Inside	N/A					
	Shoulder Width - Outside	N/A					
	Bridge Vertical Clearance	N/A					
	Structural Capacity	N/A					
	Bridge Rail	N/A					
	Bridge Approach Slab	X	N Line (307+05 to 310+34)	25-ft	25-ft min	25-ft min	DM 720.03(8) & BDM
	Protective Screening	N/A					
	OTHER						
8. Horizontal Alignment	Design Element Not Applicable						
9. Vertical Alignment	Design Element Not Applicable						
10. Cross Slope	Design Element Not Applicable						
11. Side Slope	Design Element Not Applicable						
12. Clear Zone	Design Element Not Applicable						
13. Barrier, Guardrail & Rumble Strips	Standard Run	X	N Line Throughout Project	Beam Guardrail Type 1	Beam Guardrail Type 31 and Concrete Barrier	Beam Guardrail Type 31 and Concrete Barrier	DM 1610.03(5)
	Height	X	N Line Throughout Project	Guardrail: 28-in	Guardrail: 31-in min Concrete Barrier: 2-ft 8-in min	Guardrail: 31-in min Concrete Barrier: 3-ft 6-in min	Guardrail: DM 1610.04(1)(a) Concrete Barrier: DM 1610.06(2) Sight Distance, Route Continuity, Freight Traffic, & Bike/Ped Safety
	Lateral Clearance	X	N Line Throughout Project	4-ft	4-ft	4-ft Left and 8-ft Right	DM 1239.06 Exhibit 1239-9
	Transition Section	X	N Line Throughout Project	Type 21	Type 21	Type 21	DM Exhibit 1610-13

General Design Elements	*Detailed Design Elements (Parameters)*	*Changed Elements* See Note 1	*Physical Feature/Location*	*Existing Dimension*	*Design Manual Dimension*	*Proposed Dimension*	*Reference/Notes*
	End Treatment	X	N Line (306+11.29, 306+31.11, 326+00.00)	Non-flared terminal	Non-flared Terminal, TL-2 or TL-3	Non-flared Terminal	DM 1610.04(5)(b)
	Rumble Strips	N/A					
	OTHER						
14. Signals, Illumination, and ITS	**Design Element Not Applicable**						
15. Signing and Delineation	Signing	X	N Line Throughout Project	Varies	Varies	Varies	DM 1020
	Delineation	X	N Line Throughout Project	Varies	Varies	Varies	DM 1030
	Vertical Clearance	N/A					
	OTHER						
16. On/Off Connections	**Design Element Not Applicable**						
17. Intersection / Ramp Terminal	**Design Element Not Applicable**						
18. Road Approaches	**Design Element Not Applicable**						
19. Roundabout	**Design Element Not Applicable**						
20. Access	**Design Element Not Applicable**						

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I-82 UNION GAP

Project Design Parameters

For

M Line

Main Street

Design Manual M 22-01.14 (July 2017)

Date: June 2019

Functional Classification		Urban Principal Arterial
Design Year		2035
Design Vehicle		WB-67 and 109D
Target Speed		35 MPH
Posted Speed		35 MPH
ADT:		7,000
Truck Percentage		10%
Right of Way Width:		Varies
Terrain		Rolling
Access Control		Limited/Full

Prepared By: NJB

Date Prepared: 8/19/2019

General Design Elements	*Detailed Design Elements (Parameters)*	*Changed Elements* *See Note 1*	*Physical Feature/Location*	*Existing Dimension*	*Design Manual Dimension*	*Proposed Dimension*	*Reference/Notes*
1. Lane	Number of Lanes	N/A					
	Lane Type	N/A					
	Width Tangent Roadway	X	M Line Throughout Project	12-ft	11-ft to 13-ft	12-ft to 14-ft	DM Exhibit 1360-6 Meet WB-67 and 109D Turning Movement Requirements, Route Continuity
	Width Turning Roadway	N/A					
	Lane Reduction	N/A					
2. Median / Buffer	**Design Element Not Applicable**						
3. Shoulder	Shoulder Width - Inside	N/A					
	Shoulder Width - Outside	X	M Line (50+10 to 59+83)	8-ft	4-ft min	4-ft min	DM Exhibit 1239-1
	Shoulder Width Bus Only	N/A					
	Parking Lane Width	N/A					
4. Streetside / Roadside Zone	**Design Element Not Applicable**						
5. Pedestrian Facility	**Design Element Not Applicable**						
6. Bicycle Facility	**Design Element Not Applicable**						
7. Bridges	**Design Element Not Applicable**						
8. Horizontal Alignment	Stopping Sight Distance	N/A					
	Passing Sight Distance	N/A					
	Decision Sight Distance	N/A					
	Curve Lengths	N/A					
	Horizontal Curve Radii	N/A					
	Max. Defl. Angle w/o Curve	X	M Line Throughout Project	0°53'35"	1°38'	1°38'	DM Exhibit 1210-1
	Lane Balance	N/A					
	Climbing Lanes	N/A					
	Spacing betw. Interchanges	N/A					
	Spacing betw. Ramp Noses	N/A					
	Lane Width Transition	X	M Line (53+19 to 56+09)	-	25:1 Taper	145:1 Taper	DM 1210.05(1)(a)
			M Line LT (59+83 to 60+79)			53.2:1 Taper	
			M Line RT (59+83 to 60+89)			48.0:1 Taper	
	Increase Number of Lanes	N/A					
	Channelization Taper - Left	X	M Line (53+19 to 56+09)	-	290-ft Taper	290-ft Taper	DM 1210.05(1)(b)
	Channelization Taper - Right	N/A					
	U-turn width (List any elements changed - See Chapter 1310)	N/A					
	Curbs on High Speed Road	N/A					
9. Vertical Alignment	**Design Element Not Applicable**						

General Design Elements	*Detailed Design Elements (Parameters)*	*Changed Elements* See Note 1	*Physical Feature/Location*	*Existing Dimension*	*Design Manual Dimension*	*Proposed Dimension*	*Reference/Notes*
10. Cross Slope	Cross Slope Lane	X	M Line Throughout Project	2%	2% min	2% min	DM 1250.02(1)
	Cross Slope Shoulder	X	M Line Throughout Project	2%	2% min	2% min	DM 1250.02(2)
	Cross Slope Grade Differential	N/A					
	Superelevation	N/A					
	Super Transition / Runoff	N/A					
11. Side Slope	Fill Slope	X	M Line Throughout Project	2:1	2:1 max	2:1	DM 1600.03(1)(a)
	Ditch In-Slope	N/A					
	Ditch Back Slope	N/A					
	Cut Slope	N/A					
12. Clear Zone	Clear Zone	X	M Line Throughout Project	10-ft	10-ft	10-ft	DM Exhibit 1600-2
13. Barrier, Guardrail & Rumble Strips	Standard Run	X	M Line Throughout Project	Beam Guardrail Type 1	Beam Guardrail Type 31 and Concrete Barrier	Beam Guardrail Type 31 and Concrete Barrier	DM 1610.03(5)
	Height	X	M Line Throughout Project	Guardrail: 28-in	Guardrail: 31-in min Concrete Barrier: 2-ft 8-in min	Guardrail: 31-in min Concrete Barrier: 3-ft 6-in min	Guardrail: DM 1610.04(1)(a) Concrete Barrier: DM 1610.06(2) Sight Distance, Route Continuity, Freight Traffic, & Bike/Ped Safety
	Shy Distance	N/A					
	Transition Section	X	M Line Throughout Project	Type 1	Type 21	Type 21	DM Exhibit 1610-13
	End Treatment	X	M Line (53+53.60, 56+55.73, 60+24.19)	Non-flared	Non-flared Terminal, TL-2 or TL-3	Non-flared Terminal	DM 1610.04(5)(b)
	Rumble Strips	N/A					
14. Signals, Illumination, and ITS	**Design Element Not Applicable**						
15. Signing and Delineation	Signing	X	M Line Throughout Project	Varies	Varies	Varies	DM 1020
	Delineation	X	M Line Throughout Project	Varies	Varies	Varies	DM 1030
	Vertical Clearance	N/A					
16. On/Off Connections	**Design Element Not Applicable**						
17. Intersection / Ramp Terminal	**Design Element Not Applicable**						
18. Road Approaches	**Design Element Not Applicable**						
19. Roundabout	**Design Element Not Applicable**						
20. Access	**Design Element Not Applicable**						

I-82/South Union Gap Interchange - Construct Ramps

Project Design Parameters

For

I-82 L Line

Mainline

Date: May 2019 Design Manual M 22-01.14 (July 2017)

Functional Classification	Urban Interstate
Design Year	2035
Design Vehicle	WB-67 and 109D
Target Speed	60 MPH
Posted Speed	60 MPH
ADT:	26,000
Truck Percentage	14%
Right of Way Width:	Varies
Terrain	Rolling
Access Control	Limited/Full

Prepared By: NJB

Date Prepared: 8/19/2019

General Design Elements	Detailed Design Elements (Parameters)	Changed Elements See Note 1	Physical Feature/Location	Existing Dimension	Design Manual Dimension	Proposed Dimension	Reference/Notes
1. Lane	Design Element Not Applicable						
2. Median / Buffer	Median Width	X	L Line Throughout Project	40-ft	Varies	26-ft to 40-ft	DM Exhibit 1239-10
	Median Width Taper	X	L Line (426+54.43 to 433+76.62)	-	L=VT	722-ft (V= 60mph, T=12-ft)	DM 1210.05(2)
	Buffer Width	N/A					
3. Shoulder	Shoulder Width - Inside	N/A					
	Shoulder Width - Outside	X	L Line Throughout Project	10-ft	Varies	8-ft to 10-ft	DM Exhibit 1239-1
	Shoulder Width Bus Only	N/A					
	Parking Lane Width	N/A					
4. Streetside / Roadside Zone	Design Element Not Applicable						
5. Pedestrian Facility	Design Element Not Applicable						
6. Bicycle Facility	Design Element Not Applicable						
7. Bridges	Design Element Not Applicable						
8. Horizontal Alignment	Stopping Sight Distance	N/A					
	Passing Sight Distance	N/A					
	Decision Sight Distance	N/A					
	Curve Lengths	N/A					
	Horizontal Curve Radii	N/A					
	Max. Defl. Angle w/o Curve	N/A					
	Lane Balance	N/A					
	Climbing Lanes	N/A					
	Spacing betw. Interchanges	N/A					
	Spacing betw. Ramp Noses	N/A					
	Lane Width Transition	N/A					
	Increase Number of Lanes	N/A					
	Channelization Taper - Left	N/A					
	Channelization Taper - Right	X	L Line WB (426+54 to 433+76)	-	720-ft min	720-ft	DM1210.05(1)(a)
	U-turn width (List any elements changed - See Chapter 1310)	N/A					
	Curbs on High Speed Road	N/A					
9. Vertical Alignment	Design Element Not Applicable						
10. Cross Slope	Cross Slope Lane	X	L Line Throughout Project	2%	2% min	2%	DM 1250.02(1)
	Cross Slope Shoulder	X	L Line Throughout Project	2%	2% min	2%	DM 1250.02(2)
	Cross Slope Grade Differential	N/A					
	Superelevation	N/A					
	Super Transition / Runoff	N/A					

General Design Elements	Detailed Design Elements (Parameters)	Changed Elements See Note 1	Physical Feature/Location	Existing Dimension	Design Manual Dimension	Proposed Dimension	Reference/Notes
11. Side Slope	Fill Slope	X	L Line Throughout Project	2:1 max	2:1 max	2:1	DM 1600.03(1)(a)
	Ditch In-Slope	N/A					
	Ditch Back Slope	N/A					
	Cut Slope	N/A					
12. Clear Zone	Design Element Not Applicable						
13. Barrier, Guardrail & Rumble Strips	Standard Run	X	L Line Throughout Project	Cable Barrier and Beam Guardrail Type 1	Cable Barrier, Beam Guardrail Type 31, and Concrete Barrier	Cable Barrier, Beam Guardrail Type 31, and Concrete Barrier	DM 1610.03(5)
	Height	X	L Line Throughout Project	Cable Barrier: 19-in to 35-in	Cable Barrier: 35-in Guardrail: 31-in min Concrete Barrier: 2-ft 8-in min	Cable Barrier: 35-in Guardrail: 31-in min Concrete Barrier: 3-ft 6-in min	Guardrail: DM 1610.04(1)(a) Cable Barrier: 1610.05 Conc Barrier: DM 1610.06(2) Sight Distance, Route Continuity, & Freight Traffic
	Lateral Clearance	X	L Line Throughout Project	4-ft	4-ft	4-ft	DM 1239.06 Exhibit 1239-9
	Transition Section	N/A	L Line Throughout Project	-	Type 21	Type 21	DM Exhibit 1610-13
	End Treatment	X	L Line (L 377+27, L433+67)	Cable Barrier	Varies	Guardrail Terminal, Impact Attenuator	Concrete Barrier: DM 1610.06(3) Cable Barrier: DM 1610.05(4) Impact Attenuator: DM1620
	Rumble Strips	X	L Line WB (439+13 to 443+93)	-	Varies	Varies	DM 1600.05(1)
14. Signals, Illumination, and ITS	Signals	N/A					
	Illumination	X	L Line Throughout Project	Varies	Varies	Varies	DM 1040.04(1)
	ITS	X	L Line (377+60 & 430+50)	-	-	VMS & CCTV	DM 1050
	Vertical Clearance	N/A					
15. Signing and Delineation	Signing	X	L Line Throughout Project	Varies	Varies	Varies	DM 1020
	Delineation	X	L Line Throughout Project	Varies	Varies	Varies	DM 1030
	Vertical Clearance						
16. On/Off Connections	Design Element Not Applicable						
17. Intersection / Ramp Terminal	Design Element Not Applicable						
18. Road Approaches	Design Element Not Applicable						
19. Roundabout	Design Element Not Applicable						
20. Access	Design Element Not Applicable						

I-82 UNION GAP

Project Design Parameters

For

C Line

SR-97 NB Off-Ramp to Main Street WB

Date: July 2019 Design Manual M 22-01.14 (July 2017)

Functional Classification		Ramp
Design Year		2035
Design Vehicle		WB-67 and 109D
Target Speed		25 to 60 MPH
Posted Speed		N/A
ADT:		3,000-9,500
Truck Percentage		10% to 14%
Right of Way Width:		Varies
Terrain		Rolling
Access Control		Limited/Full

Prepared By: NJB

Date Prepared: 8/19/2019

General Design Elements	Detailed Design Elements (Parameters)	Changed Elements See Note 1	Physical Feature/Location	Existing Dimension	Design Manual Dimension	Proposed Dimension	Reference/Notes
1. Lane	Width Tangent Roadway	X	C Line Throughout Project	16-ft	11-ft to 13-ft	14-ft	DM Exhibit 1360-6 Meet WB-67 and 109D Turning Movement Requirements, Route Continuity
	Width Turning Roadway	X	C Line Throughout Project	16-ft	Varies	14-ft	DM Exhibit 1240-3a Meet WB-67 and 109D Turning Movement Requirements, Route Continuity
2. Median / Buffer	**Design Element Not Applicable**						
3. Shoulder	**Design Element Not Applicable**						
4. Streetside / Roadside Zone	**Design Element Not Applicable**						
5. Pedestrian Facility	**Design Element Not Applicable**						
6. Bicycle Facility	**Design Element Not Applicable**						
7. Bridges	**Design Element Not Applicable**						
8. Horizontal Alignment	Stopping Sight Distance	N/A					
	Passing Sight Distance	N/A					
	Decision Sight Distance	N/A					
	Curve Lengths	X	C Line (80+00 to 80+77)	77-ft	500-ft desirable	No change	DM 1210.02(3) Meet WB-67 and 109D Turning Movement Requirements
			C Line (80+77 to 82+31)	154-ft		No change	
			C Line (82+31 to 85+88)	357-ft		No change	
			C Line (85+88 to 89+79)	507-ft		390-ft	
			C Line (89+79 to 92+68)	201-ft		290-ft	
	Horizontal Curve Radii	X	C Line (80+00 to 80+77)	400-ft	145-ft min	No change	DM Exhibit 1250-4a 10% Max Superelevation Table Meet WB-67 and 109D Turning Movement Requirements
			C Line (80+77 to 82+31)	300-ft		No change	
			C Line (82+31 to 85+88)	218-ft		No change	
			C Line (85+88 to 89+79)	226-ft		No change	
			C Line (89+79 to 92+68)	633-ft		328-ft	
	Max. Defl. Angle w/o Curve	N/A					
	Lane Balance	N/A					
	Climbing Lanes	N/A					
	Spacing betw. Interchanges	N/A					
	Spacing betw. Ramp Noses	N/A					
	Lane Width Transition	N/A					
	Increase Number of Lanes	N/A					
	Channelization Taper - Left	N/A					
	Channelization Taper - Right	N/A					
	U-turn width (List any elements changed - See Chapter 1310)	N/A					
	Curbs on High Speed Road	N/A					
	OTHER						
9. Vertical Alignment	**Design Element Not Applicable**						
10. Cross Slope	Cross Slope Lane	X	C Line Throughout Project	-	2% min	2% min	DM 1250.02(1)
	Cross Slope Shoulder	X	C Line Throughout Project	-	2% min	2% min	DM 1250.02(2)
	Cross Slope Grade Differential	N/A					
	Superelevation	N/A	C Line Throughout Project	-	-	-	-

General Design Elements	*Detailed Design Elements (Parameters)*	*Changed Elements* *See Note 1*	*Physical Feature/Location*	*Existing Dimension*	*Design Manual Dimension*	*Proposed Dimension*	*Reference/Notes*
10. Cross Slope	Super Transition / Runoff	X	C Line Throughout Project	-	145-ft (35 mph, 8% Super)	145-ft	DM Exhbit 1250-7b
	OTHER						
11. Side Slope	**Design Element Not Applicable**						
12. Clear Zone	**Design Element Not Applicable**						
13. Barrier, Guardrail & Rumble Strips	Standard Run	X	C Line (81+56 to 90+27)	Beam Guardrail Type 1	Beam Guardrail Type 31 and Concrete Barrier	Concrete Barrier	DM 1610.03(5)
	Height	X	C Line (81+56 to 90+27)	Guardrail: 28-in	Guardrail: 31-in min Concrete Barrier: 2-ft 8-in min	Concrete Barrier: 3-ft 6-in min	DM 1610.06(2) Sight Distance, Route Continuity, Freight Traffic, & Bike/Ped Safety
	Lateral Clearance	X	C Line Throughout Project	4-ft	4-ft	4-ft Left and 8-ft Right	DM 1239.06 Exhibit 1239-9
	Transition Section	X	C Line Throughout Project	-	Varies	Concrete Barrier	DM 1610.06
	End Treatment	X	C Line (81+83.17 & 90+26.87)	-	Varies	Impact Attenuator	DM 1610.06(3) & DM 1620
	Rumble Strips	X	C Line (90+27 to 92+32)	-	Varies	Varies	DM 1600.05(1)
	OTHER						
14. Signals, Illumination, and ITS	Signals	N/A					
	Illumination	X	C Line Throughout Project	Varies	Varies	Varies	DM 1040.04(1)
	ITS	X	C Line (82+31)	-	-	CCTV	DM 1050
	Vertical Clearance	N/A					
	OTHER						
15. Signing and Delineation	Signing	X	C Line Throughout Project	Varies	Varies	Varies	DM 1020
	Delineation	X	C Line Throughout Project	Varies	Varies	Varies	DM 1030
	Vertical Clearance	N/A					
	OTHER						
16. On/Off Connections	**Design Element Not Applicable**						
17. Intersection / Ramp Terminal	**Design Element Not Applicable**						
18. Road Approaches	**Design Element Not Applicable**						
19. Roundabout	**Design Element Not Applicable**						
20. Access	**Design Element Not Applicable**						

I-82/South Union Gap Interchange - Construct Ramps

Project Design Parameters

For

B Line

Main Street EB On-Ramp to I-82 WB

Date: July 2019 Design Manual M 22-01.14 (July 2017)

Functional Classification	Ramp
Design Year	2035
Design Vehicle	WB-67 and 109D
Target Speed	25 to 35 MPH
Posted Speed	N/A
ADT:	3,000-9,500
Truck Percentage	10% to 14%
Right of Way Width:	Varies
Terrain	Rolling
Access Control	Limited/Full

Prepared By: NJB

Date Prepared: 8/19/2019

General Design Elements	Detailed Design Elements (Parameters)	Changed Elements See Note 1	Physical Feature/Location	Existing Dimension	Design Manual Dimension	Proposed Dimension	Reference/Notes
1. Lane	Number of Lanes	X	B Line Throughout Project	-	1 to 2 Lanes	1 Lane	DM 1360.03(4)
	Lane Type	X	B Line Throughout Project	-	Through	Through	DM 1231.04(1)
	Width Tangent Roadway	X	B Line Throughout Project	-	11-ft to 13-ft	14-ft	DM Exhibit 1360-6 Meet WB-67 and 109D Turning Movement Requirements, Route Continuity
	Width Turning Roadway	X	B Line Throughout Project	-	15-ft to 18-ft	14-ft Lane + 4-ft Left Shoulder + 8-ft Right Shoulder	DM Exhibit 1240-3a Meet WB-67 and 109D Turning Movement Requirements, Route Continuity
	Lane Reduction	N/A					
	OTHER						
2. Median / Buffer	**Design Element Not Applicable**						
3. Shoulder	Shoulder Width - Inside	X	B Line Throughout Project	-	2-ft	4-ft	DM Exhibit 1360-6 Meet WB-67 and 109D Turning Movement Requirements, Route Continuity
	Shoulder Width - Outside	X	B Line Throughout Project	-	4-ft to 8-ft	8-ft	DM Exhibit 1360-6 Meet WB-67 and 109D Turning Movement Requirements, Route Continuity
	Shoulder Width Bus Only	N/A					
	Parking Lane Width	N/A					
	OTHER						
4. Streetside / Roadside Zone	**Design Element Not Applicable**						
5. Pedestrian Facility	**Design Element Not Applicable**						
6. Bicycle Facility	**Design Element Not Applicable**						
7. Bridges	Lane Type	X	B Line (203+85 to 207+12)	-	Through	Through	DM 1231.04(1)
	Width Tangent Roadway	X	B Line (203+85 to 207+12)	-	11-ft min	14-ft	DM Exhibit 1360-6 Route Continuity & Freight Traffic
	Width Turning Roadway	X	B Line (203+85 to 207+12)	-	13-ft min	14-ft	DM Exhibit 1240-2a & 3a Route Continuity & Freight Traffic
	Shoulder Width - Inside	X	B Line (203+85 to 207+12)	-	2-ft min	4-ft	DM Exhibit 1360-6 Route Continuity & Freight Traffic
	Shoulder Width - Outside	X	B Line (203+85 to 207+12)	-	4-ft min	8-ft	DM Exhibit 1360-6 Route Continuity, Freight Traffic, & Bike/Ped Safety
	Bridge Vertical Clearance	X	B Line (203+85 to 207+12)	-	16.5-ft min	17.5-ft	DM 720.03(5)(b)(1)
	Structural Capacity	X	B Line (203+85 to 207+12)	-	LRFD HL-93	LRFD HL-93	DM 720.03(1)(a)
	Bridge Rail	X	B Line (203+85 to 207+12)	-	2-ft 8-in min	3-ft 6-in	DM 1610.07 Route Continuity, Freight Traffic, & Bike/Ped Safety
	Bridge Approach Slab	X	B Line (203+85 to 207+12)	-	25-ft min	26-ft	DM 720.03(8) & BDM
	Protective Screening	N/A					
	OTHER						

General Design Elements	*Detailed Design Elements (Parameters)*	*Changed Elements* *See Note 1*	*Physical Feature/Location*	*Existing Dimension*	*Design Manual Dimension*	*Proposed Dimension*	*Reference/Notes*
8. Horizontal Alignment	Stopping Sight Distance	X	B Line (201+35 to 203+65)	-	155-ft min	N/A No Obstruction	DM Exhibit 1260-9
			B Line (208+23 to 213+23)				
			B Line (213+23 to 216+93)				
			B Line (216+93 to 220+87)				
			B Line (220+87 to 221+75)				
	Passing Sight Distance	N/A					
	Decision Sight Distance	N/A					
	Curve Lengths	X	B Line (201+35 to 203+65)	-	500-ft desirable	230-ft	DM 1210.02(3) Meet WB-67 and 109D Turning Movement Requirements
			B Line (208+23 to 213+23)			500-ft	
			B Line (213+23 to 216+93)			371-ft	
			B Line (216+93 to 220+87)			394-ft	
			B Line (220+87 to 221+75)			88-ft	
	Horizontal Curve Radii	X	B Line (201+35 to 203+65)	-	130-ft min	2,430-ft	Meet WB-67 Turning Movement Requirements. See Design Documentation
			B Line (208+23 to 213+23)			550-ft	
			B Line (213+23 to 216+93)			130-ft	
			B Line (216+93 to 220+87)			4,000-ft	
			B Line (220+87 to 221+75)			24,882-ft	
	Max. Defl. Angle w/o Curve	N/A					
	Lane Balance	N/A					
	Climbing Lanes	N/A					
	Spacing betw. Interchanges	N/A					
	Spacing betw. Ramp Noses	N/A					
	Lane Width Transition	X	B Line (216+93 to 220+87)	-	25:1	196.5:1 Taper	DM 1210.05(1)(a) Meet WB-67 and 109D Turning Movement Requirements
	Increase Number of Lanes	N/A					
	Channelization Taper - Left	N/A					
	Channelization Taper - Right	N/A					
	U-turn width (List any elements changed - See Chapter 1310)	N/A					
	Curbs on High Speed Road	N/A					
	OTHER						

General Design Elements	Detailed Design Elements (Parameters)	Changed Elements See Note 1	Physical Feature/Location	Existing Dimension	Design Manual Dimension	Proposed Dimension	Reference/Notes
9. Vertical Alignment	Stopping Sight Distance	X	B Line (201+70 to 202+75)	-	155-ft min	549-ft	DM Exhibit 1260-1
			B Line (203+88 to 207+88)			327-ft	
			B Line (207+89 to 209+79)			1,238-ft	
			B Line (212+65 to 215+65)			545-ft	
	Decision Sight Distance	N/A					
	Passing Sight Distance	N/A					
	Minimum Grade	X	B Line (201+70 to 202+75)	-	Varies	2.43%	DM 1220.02(4) To meet draingae requirements. Ditch gradient independent of roadway grade if necessary.
			B Line (203+88 to 207+88)			3.24%	
			B Line (207+89 to 209+79)			2.74%	
			B Line (212+65 to 215+65)			0.18%	
	Length of Grade	X	B Line (202+22 to 205+88)	-	1,550-ft max	366-ft	DM Exhibit 1220-1
	Vertical Curve Length	X	B Line (201+70 to 202+75)	-	75-ft min	105-ft	DM Exhibit 1260-1
			B Line (203+88 to 207+88)			400-ft	
			B Line (207+89 to 209+79)			190-ft	
			B Line (212+65 to 215+65)			300-ft	
	Maximum Grade	X	B Line (201+70 to 202+75)	-	Varies	3.24%	DM 1220.02(3)
			B Line (203+88 to 207+88)			4.81%	
			B Line (207+89 to 209+79)			4.81%	
			B Line (212+65 to 215+65)			2.74%	
	OTHER						
10. Cross Slope	Cross Slope Lane	X	B Line Throughout Project	-	2% min	2% min	DM 1250.02(1)
	Cross Slope Shoulder	X	B Line Throughout Project	-	2% min	2% min	DM 1250.02(2)
	Cross Slope Grade Differential	N/A					
	Superelevation	X	B Line Throughout Project	-	9%	9%	DM Exhibit 1250-4a 10% Max Superelevation Table Meet drainage max. runoff slope of 9.3%. See Design Documentation
	Super Transition / Runoff	X	B Line (207+36 to 208+81)	-	145-ft (35 mph, 8% Super)	145-ft	DM Exhibit 1250-7b
			B Line (216+01 to 217+51)		150-ft (25 mph, 9% Super)	150-ft	
	OTHER						
11. Side Slope	Fill Slope	X	B Line Throughout Project	-	2:1 max	2:1 max	DM 1600.03(1)(a)
	Ditch In-Slope	N/A					
	Ditch Back Slope	N/A					
	Cut Slope	X	B Line Throughout Project	-	2:1 max	2:1 max	DM 1600.03(1)(b)
	OTHER						
12. Clear Zone	Clear Zone	X	B Line Throughout Project	-	Varies 10-ft to 37-ft	Protected by Guardrail/Barrier	DM Exhibit 1600-2
	OTHER						
13. Barrier, Guardrail & Rumble Strips	Standard Run	X	B Line Throughout Project	-	Beam Guardrail Type 31 and Concrete Barrier	Beam Guardrail Type 31 and Concrete Barrier	DM 1610.03(5)
	Height	X	B Line Throughout Project	-	Guardrail: 31-in min Concrete Barrier: 2-ft 8-in min	Guardrail: 31-in min Concrete Barrier: 3-ft 6-in min	Guardrail: DM 1610.04(1)(a) Concrete Barrier: DM 1610.06(2) Sight Distance, Route Continuity, Freight Traffic, & Bike/Ped Safety
	Lateral Clearance	X	B Line Throughout Project	-	4-ft	4-ft Left and 8-ft Right	DM 1239.06 Exhibit 1239-9

General Design Elements	Detailed Design Elements (Parameters)	Changed Elements See Note 1	Physical Feature/Location	Existing Dimension	Design Manual Dimension	Proposed Dimension	Reference/Notes
	Transition Section	X	B Line Throughout Project	-	Type 21	Type 21	DM Exhibit 1610-13
	End Treatment	X	B Line (202+70.89, 209+00.00, 209+53.16, 212+90.00, 216+23.70, 216+92.18)	-	Non-flared terminal, TL-2 or TL-3	Non-flared Terminal	DM 1610.04(5)(b)
	Rumble Strips	X	B Line (B 216+93 to L 439+13)	-	Varies	Varies	DM 1600.05(1)
	OTHER						
14. Signals, Illumination, and ITS	Signals	N/A					
	Illumination	X	B Line On-ramp gore area	-	Varies	Varies	DM 1040.04(1)
	ITS	N/A					
	Vertical Clearance	N/A					
	OTHER						
15. Signing and Delineation	Signing	X	B Line Throughout Project	-	Varies	Varies	DM 1020
	Delineation	X	B Line Throughout Project	-	Varies	Varies	DM 1030
	Vertical Clearance	N/A					
	OTHER						
16. On/Off Connections	On/Off Connection Type	X	B Line	-	Varies	Single-Lane, Parallel	DM 1360.04(4)(c)
	Acceleration length	X	B Line (B 216+93 to L 433+76)	-	1,020-ft min	1,020-ft	DM Exhibit 1360-9
	Deceleration Length	N/A					
	Ramp / Mainline Taper	N/A					
	Gap Acceptance	X	B Line (B 221+75 to L 433+76)	-	300-ft min	537-ft	DM Exhibit 1360-13b
	Transition curve	X	B Line (B 216+93 to B 220+87)	-	3,000-ft min radius 300-ft des length	4,000-ft radius 394-ft length	DM Exhibit 1360-13b
	Enforcement Area	N/A					
	Ramp Meter Storage	N/A					
	Weave	N/A					
	Gore Area	X	B Line (216+75)	-	4-ft min radius	4-ft radius	DM Exhibit 1360-16
	Reserve Area Length	N/A					
	Reserve Area Taper	N/A					
	OTHER						
17. Intersection / Ramp Terminal	**Design Element Not Applicable**						
18. Road Approaches	**Design Element Not Applicable**						
19. Roundabout	**Design Element Not Applicable**						
20. Access	**Design Element Not Applicable**						

I-82 UNION GAP

Project Design Parameters

For

A Line

I-82 EB Off-Ramp to Main Street WB

Date: July 2019 Design Manual M 22-01.14 (July 2017)

Functional Classification		Ramp
Design Year		2035
Design Vehicle		WB-67 and 109D
Target Speed		25 -60 MPH
Posted Speed		N/A
ADT:		3,000-9,500
Truck Percentage		10% to 14%
Right of Way Width:		Varies
Terrain		Rolling
Access Control		Limited/Full

Prepared By: NJB

Date Prepared: 8/19/2019

General Design Elements	Detailed Design Elements (Parameters)	Changed Elements See Note 1	Physical Feature/Location	Existing Dimension	Design Manual Dimension	Proposed Dimension	Reference/Notes
1. Lane	Number of Lanes	X	A Line Throughout Project	-	1 to 2 Lanes	1 lane	DM 1360.03(4)
	Lane Type	X	A Line Throughout Project	-	Through	Through	DM 1231.04(1)
	Width Tangent Roadway	X	A Line Throughout Project	-	11-ft to 13-ft	12-ft to 14-ft	DM Exhibit 1360-6 Meet WB-67 and 109D Turning Movement Requirements, Route Continuity
	Width Turning Roadway	X	A Line Throughout Project	-	17-ft	14-ft Lane + 4-ft Left Shoulder + 8-ft Right Shoulder	DM Exhibit 1240-3a Meet WB-67 and 109D Turning Movement Requirements, Route Continuity
	Lane Reduction	N/A					
	OTHER						
2. Median / Buffer	Design Element Not Applicable						
3. Shoulder	Shoulder Width - Inside	X	A Line Throughout Project	-	2-ft	4-ft	DM Exhibit 1360-6 Meet WB-67 and 109D Turning Movement Requirements, Route Continuity
	Shoulder Width - Outside	X	A Line Throughout Project	-	4-ft to 8-ft	8-ft	DM Exhibit 1360-6 Meet WB-67 and 109D Turning Movement Requirements, Route Continuity
	Shoulder Width Bus Only	N/A					
	Parking Lane Width	N/A					
	OTHER						
4. Streetside / Roadside Zone	Design Element Not Applicable						
5. Pedestrian Facility	Design Element Not Applicable						
6. Bicycle Facility	Design Element Not Applicable						
7. Bridges	Design Element Not Applicable						
8. Horizontal Alignment	Stopping Sight Distance	X	A Line (14+67 to 22+09)	-	155-ft	192-ft	DM Exhbit 1260-9
	Passing Sight Distance	N/A					
	Decision Sight Distance	N/A					
	Curve Lengths	X	A Line (14+67 to 22+09)	-	500-ft desirable	742-ft	DM 1210.02(3) Meet WB-67 and 109D Turning Movement Requirements
	Horizontal Curve Radii	X	A Line (14+67 to 22+09)	-	145-ft min	311.7-ft	DM Exhibit 1250-4a 10% Max Superelevation Table Meet WB-67 and 109D Turning Movement Requirements
	Max. Defl. Angle w/o Curve	N/A					
	Lane Balance	N/A					
	Climbing Lanes	N/A					
	Spacing betw. Interchanges	N/A					
	Spacing betw. Ramp Noses	X	A Line (L 412+26 to L 407+56)	-	1,000-ft min	1,520-ft	DM Exhbit 1360-3
	Lane Width Transition	N/A					
	Increase Number of Lanes	N/A					
	Channelization Taper - Left	N/A					

General Design Elements	Detailed Design Elements (Parameters)	Changed Elements See Note 1	Physical Feature/Location	Existing Dimension	Design Manual Dimension	Proposed Dimension	Reference/Notes
	Channelization Taper - Right	N/A					
	U-turn width (List any elements changed - See Chapter 1310)	N/A					
	Curbs on High Speed Road	N/A					
	OTHER						
9. Vertical Alignment	Stopping Sight Distance	X	A Line (14+36 to 16+24)	-	155-ft min	238-ft	DM Exhibit 1260-1
			A Line (16+56 to 18+09)			229-ft	
			A Line (18+09 to 19+92)			1,861-ft	
			A Line (21+58 to 22+42)			602-ft	
	Decision Sight Distance	N/A					
	Passing Sight Distance	N/A					
	Minimum Grade	X	A Line (14+36 to 16+24)	-	Varies	0.27%	DM 1220.02(4) To meet draingae requirements. Ditch gradient independent of roadway grade if necessary.
			A Line (16+56 to 18+09)			3.09%	
			A Line (18+09 to 19+92)			1.14%	
			A Line (21+58 to 22+42)			0.55%	
	Length of Grade	X	A Line (15+30 to 17+27)	-	1,100-ft max	202-ft	DM Exhibit 1220-1
	Vertical Curve Length	X	A Line (14+36 to 16+24)	-	75-ft min	188-ft	DM Exhibit 1260-1
			A Line (16+56 to 18+09)			153-ft	
			A Line (18+09 to 19+92)			183-ft	
			A Line (21+58 to 22+42)			84-ft	
	Maximum Grade	X	A Line (14+36 to 16+24)	-	Varies	4.01%	DM 1220.02(3)
			A Line (16+56 to 18+09)			4.01%	
			A Line (18+09 to 19+92)			3.09%	
			A Line (21+58 to 22+42)			1.14%	
10. Cross Slope	Cross Slope Lane	X	A Line Throughout Project	-	2% min	2% min	DM 1250.02(1)
	Cross Slope Shoulder	X	A Line Throughout Project	-	2% min	2% min	DM 1250.02(2)
	Cross Slope Grade Differential	N/A					
	Superelevation	X	A Line Throughout Project	-	8%	8%	DM Exhibit 1250-4a 10% Max Superelevation Table Meet WB-67 and 109D Turning Movement Requirements
	Super Transition / Runoff	X	A Line Throughout Project	-	130-ft	145-ft	DM Exhbit 1250-7b. Longer transition to match C line cross slope.
	OTHER						
11. Side Slope	Fill Slope	X	A Line Throughout Project	-	2:1 max	2:1 max (LT) 3:1 max (RT)	DM 1600.03(1)(a)
	Ditch In-Slope	N/A					
	Ditch Back Slope	N/A					
	Cut Slope	X	A Line Throughout Project	-	2:1 max	2:1 max	DM 1600.03(1)(b)
	OTHER						
12. Clear Zone	Clear Zone	X	A Line Throughout Project	-	Varies 10-ft to 37-ft	Protected by Guardrail/Barrier	DM Exhibit 1600-2
	OTHER						

General Design Elements	*Detailed Design Elements (Parameters)*	*Changed Elements* *See Note 1*	*Physical Feature/Location*	*Existing Dimension*	*Design Manual Dimension*	*Proposed Dimension*	*Reference/Notes*
13. Barrier, Guardrail & Rumble Strips	Standard Run	X	A Line Throughout Project	-	Beam Guardrail Type 31 and Concrete Barrier	Beam Guardrail Type 31 and Concrete Barrier	DM 1610.03(5)
	Height	X	A Line Throughout Project	-	Guardrail: 31-in min Concrete Barrier: 2-ft 8-in min	Guardrail: 31-in min Concrete Barrier: 3-ft 6-in min	Guardrail: DM 1610.04(1)(a) Concrete Barrier: DM 1610.06(2) Sight Distance, Route Continuity, Freight Traffic, & Bike/Ped Safety
	Lateral Clearance	X	A Line Throughout Project	-	4-ft	4-ft Left and 8-ft Right	DM 1239.06 Exhibit 1239-9
	Transition Section	X	A Line Throughout Project	-	Type 21	Type 21	DM Exhibit 1610-13
	End Treatment	X	L 420+98.24, L 422+16.85, A 10+35.00	-	Non-flared Terminal, TL-2 or TL-3	Non-flared Terminal	DM 1610.04(5)(b)
	Rumble Strips	X	A Line (19+84 to 22+42)	-	Varies	Varies	DM 1600.05(1)
	OTHER						
14. Signals, Illumination, and ITS	Signals	N/A					
	Illumination	X	A Line Off-ramp gore area	-	Varies	Varies	DM 1040.04(1)
	ITS	N/A					
	Vertical Clearance	N/A					
	OTHER						
15. Signing and Delineation	Signing	X	A Line Throughout Project	-	Varies	Varies	DM 1020
	Delineation	X	A Line Throughout Project	-	Varies	Varies	DM 1030
	Vertical Clearance	N/A					
	OTHER						
16. On/Off Connections	On/Off Connection Type	x	A Line Off-ramp	-	Varies	Single-Lane,Tapered	DM 1360.04(5)
	Acceleration length	N/A					
	Deceleration Length	X	A Line Off-ramp (9+76 to 14+36)	-	460-ft min	460-ft	DM Exhibit 1360-10
	Ramp / Mainline Taper	X	A Line Off-ramp	-	15:1 min	20:1	DM Exhibit 1360-14a
	Gap Acceptance	N/A					
	Transition curve	N/A					
	Enforcement Area	N/A					
	Ramp Meter Storage	N/A					
	Weave	N/A					
	Gore Area	X	A Line Off-ramp	-	Varies	4' Radius	DM Exhibit 1360-11a
	Reserve Area Length	X	A Line Off-ramp	-	45-ft	85-ft	DM Exhibit 1360-11a
	Reserve Area Taper	X	A Line Off-ramp	-	30:1	30:1	DM Exhibit 1360-11a
	OTHER						
17. Intersection / Ramp Terminal	**Design Element Not Applicable**						
18. Road Approaches	**Design Element Not Applicable**						
19. Roundabout	**Design Element Not Applicable**						
20. Access	**Design Element Not Applicable**						

Note to File

Date: September 16, 2019

To: Raechel Chandler, WSDOT

From: Yongliang Zhu, PE, Lochner

Re: **B-Line On-ramp Super Elevation**
I-82 South Union Gap Interchange – Construct Ramps
Contact No.: C9247

The B-Line is required to be designed for WB-67 and WB-109D design vehicles with a design speed of 25 mph. The 2035 AADT for the B-Line ramp is estimated to be 1,760 vehicles per day.

To meet the design standards, the current B-Line has a 14' traveled lane, 4' left shoulder, and 8' right shoulder with a 130' horizontal curve and a 2.7% maximum vertical profile at the loop location.

Per Equation 3-8 from 2018 version of AASHTO "*A Policy Geometric Design of Highways and Streets*",

U.S. Customary	Metric	
$R_{min} = \frac{V^2}{15(0.01e_{max} + f_{max})}$	$R_{min} = \frac{V^2}{127(0.01e_{max} + f_{max})}$	(3-8)

with V = 25 MPH, Rmin = 130 feet, Fmax = 0.23 (per Figure 3-4 and Table 3-7, 2018 AASHTO),

Emax is calculated as 0.09.

Using Equations 3-8 with the above variables identified, the B line radius of 130 feet with a superelevation of 9% meets AASHTO Design standards.

Note to File

Date: October 14, 2019

To: Raechel Changler, WSDOT

From: Yongliang Zhu, PE, Lochner

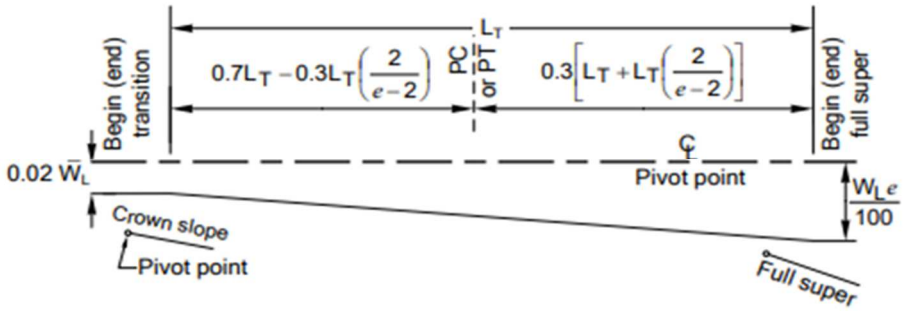
Re: **B-Line On-ramp Super Elevation Transition**
I-82 South Union Gap Interchange – Construct Ramps
Contact No.: C9247

Per request from the October 1, 2019 WSDOT Interchange Plan for Approval review comments, the design documentation for I-82 South Union Gap Interchange B Line superelevation transition calculations are provided as follows:

Per WSDOT Design Manual Chapter 1250, Exhibit 1250-7b, the B-Line superelevation transitions need to follow Table 3 shown below:

Cross Slope and Superelevation ***Chapter 1250***

Exhibit 1250-7b Superelevation Transitions for Ramp Curves



e (%)	Length of Transition in Feet for Design Speed							
	20 mph	25 mph	30 mph	35 mph	40 mph	45 mph	50 mph	55 mph
	L_T	L_T	L_T	L_T	L_T	L_T	L_T	L_T
3	20	25	25	25	25	30	30	35
4	40	45	45	50	55	55	60	65
5	60	65	70	75	80	85	90	95
6	80	85	90	100	105	115	120	130
7	100	105	115	120	130	140	150	160
8	120	130	135	145	160	170	180	190
9	140	150	160	170	185	195	210	225
10	160	170	180	195	210	225	240	255

Table 3 Pivot Point on Edge of Traveled Way: Curve in Direction of Normal Pavement Slope

1. The proposed superelevation transition Lengths for B line are shown in the table follow:

PC	PT/PCC	PCC	FROM SUPER	TO SUPER	DESIGN SPEED	DESIGNED LENGTH OF TRANSITION	EXHIBIT 1250-7B LENGTH OF TRANSITION	Meet Design Standard or Not
201+34.67								
	203+65.08		4	2	35	50	50	Yes
208+22.80			2	8	35	145	145	Yes
	213+22.59	213+22.59	8	9	25	45	21.4	Yes
	216+93.12	216+93.12	9	2	25	150	150	Yes
	220+87.40							

As shown, the proposed superelevation transition lengths for B line meet the WSDOT Design Manual requirements.

2. The proposed superelevation transition begin and end Locations for B line are shown in the table follow:

TRANSITION	BEGIN TRANSITION STATION PER DESIGN MANUAL	PROPOSED BEGIN TRANSITION STATION	END TRANSITION STATION PER DESIGN MAUNAL	PROPOSED END TRANSITION STATION	DIFFERENCE IN FEET	DESIGN CONSIDERATION
4% to 2%	203+35.08	203+18.00	203+85.08	203+68.00	17.1	Keep the super transition out of the new bridge structure
2% to 8%	207+35.80	207+97.29	208+80.80	209+42.29	61.5	Keep the super transition out of the new bridge structure
8% to 9%	213+09.73	212+80.08	213+43.52	213+25.08	18.4	Better Match the existing westbound off ramp cross slope
9% to 2%	216+35.26	216+23.08	217+85.26	217+73.08	12.2	Better Match the existing westbound I-82 mainline gore area cross slope

The proposed superelevation transition begin and end stations did not exactly match the WSDOT Design Manual calculations due to the design optimization between the new bridge, existing off ramp, I-82 mainline and the X Line alignment. The proposed design will keep the super transition areas out of the bridge structure and match the existing roadway better. The modification to the superelecation transition begin and end locations are considered commonly. It will have minimal impact to the vehicle operation on the ramp.